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SAMPLING OF SCAVENGED WASTE

by

H. V. Clukey

Radiological Engineering Section
Radiological Sciences Department
Hanford Atomic Products Operation
General Electric Company

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SAMPLING OF SCAVENGED WASTE

Introduction

Sampling and analysis of scavenged waste is necessary to determine if the settled supernate is suitable for disposal to ground and to make corrections in pretreatment of the waste with minimum delay if unsuitable supernate is being produced. From experience to date with TBP waste scavenging and initial first cycle waste scavenging, which are generally similar, the following procedures for sampling, analysis, and reporting of results for these two wastes are recommended to fulfill Radiological Sciences' needs.

This document supersedes the paragraph "Sampling and Inventory" on pages 3 and 4 of document HW-30052, TBP Waste Disposal Project, Criteria For Cribbing Scavenged RAW, by H. V. Clukey, 1-27-54.

Plant Sampling

Samples should be taken in the separations plant of the waste before and after addition of the scavenging chemicals to permit close control of the variables affecting adequate scavenging and to measure the effectiveness of scavenging.

Samples of the unneutralized waste before addition of scavenging chemicals should be analyzed for alpha, beta, cesium, strontium and phosphate ion. Phosphate ion in the range 0.1 to 0.2 molar in the final supernate has been found necessary to adequate adsorption of strontium in soil.

Samples of the neutralized waste with scavenging chemicals added, taken before the waste leaves the separations plant for the underground settling tank, should be filtered or centrifuged and the supernate analyzed for pH in addition to the five components listed above. The pH measurement checks the operation of the automatic pH controller.

Samples from before and after addition of scavenging chemicals taken once each week provide sufficient information on effectiveness of scavenging, although more frequent pH analyses may be considered advisable by Operations. The individual results should be tabulated with date and location of sampling, and at least once each month copies mailed to:

H. V. Clukey 3702 Bldg. 300 Area	and	R. E. Brown 222-U Bldg. 200-W Area

Tank Sampling

From TBP experience the waste should be allowed to settle in the underground storage tank at least seven days after the last addition to the tank before sampling. In practice, sampling is scheduled for the weekend (when the work load is reduced) closest to seven days after the last addition, and not sooner than five days when settling is still continuing near the bottom of the supernate.

Samples should be taken of the clear supernate at not more than 5 ft. depth increments to reduce misinformation resulting from layering, which has occurred in TBP waste tanks. The highest sample which contains solid precipitates (sludge)

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should be emptied back into the tank, but noting the depth from which it was taken. Each sample should be analyzed for pH, total beta, radiocesium and radiostrontium. Aliquots of each sample should be combined and the composite analyzed for pH, phosphate ion, dissolved salts (wt. %), total beta, plutonium, uranium, cesium ^{137}, radiostrontium, strontium ^{90}, and other beta-emitting radioisotopes contributing more than 10% each to the total beta emission. From TBP experience these other radioisotopes may include but are not limited to ruthenium, zirconium-niobium, cerium, rare earths plus yttrium, and antimony.

To speed recommendations for disposal of each tankful of supernate, the analytical results should be telephoned either from the 222-S laboratory or the separations plant to H. V. Clukey, phone 3735, as soon as most or all of the results are obtained (initial interest is in total beta, cesium and strontium results). Copies of the completed analytical report should be mailed from 222-S laboratory to:

H. V. Clukey 3702 Building 300 Area	and	R. E. Brown 222-U Building 200-W Area

A representative sample of the supernate or an aliquot composite of approximately 500 ml shall be delivered to Earth Sciences Unit, 222-U Building, for soil tests. Currently, prior arrangements to receive the samples should be made with D. W. Rhodes (ph. 7529) for TBP samples and with J. R. Mc Henry (ph. 7530) for first cycle samples. Occasionally additional samples may be requested by Earth Sciences Unit to confirm or extend the test of each tankful.

Official recommendations for disposal of each tankful of supernate will be sent by letter from Radiological Engineering Section, addressed to the Head, Production Planning and Scheduling Unit, Separations Section, with copies to other interested or responsible supervision.

Cribbing Sampling

A requisite for radioactive liquid waste disposal is that adequate inventory of radioactive material released to the ground be reported promptly to the Radiological Sciences Department. Samples are to be taken from the discharge line to each crib. From experience with scavenged waste, it is now considered sufficient to obtain one sample from each 100,000 gallons for scavenged first cycle or TBP supernate discharged to the cribs intended to routinely receive these wastes.

Each sample shall be analyzed for pH, radiocesium and radiostrontium. Aliquots of each sample shall be combined and the composite analyzed for pH, phosphate ion, nitrate ion, dissolved salts (wt. %), plutonium, uranium, total beta emitters, cesium ^{137}, radiostrontium, strontium ^{90}, rare earths plus yttrium, ruthenium, antimony, and all other beta-emitting radioisotopes contributing more than 10% each to the total beta emission. All radioactive densities shall be reported in units of microcuries per cubic centimeter ($\mu c/cc$). For uniformity, ionic concentrations should be reported as molarity.

It is requested that copies of the detailed routine laboratory procedures, methods of computation leading to the reported units, and statistical accuracy of reported activity densities for each radioisotope analyzed for in scavenged waste be placed on file with the Radiological Standards Unit, together with all subsequent changes to

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the procedures, methods and accuracies. This basic information on file will permit the Radiological Sciences Department to compare current and future analytical results without recourse to laboratory workbooks, extensive literature searches, or interruption of the 222-S Laboratory routine work.

The following data shall be reported in writing to the Exposure Illustrator (H. J. Paas, 703 Building), Radiological Sciences Department promptly after each tankful of scavenged supernate is discharged to ground:

1. Batch number
2. Dates, start and end of discharge
3. Crib number
4. Volume, gallons, from actual measurements (tank levels, integrating flow meter, etc.)
5. Analytical results

By letter of March 28, 1955, R. S. Bell, Manager, Separations Section, has assigned responsibility for sending reports to the Exposure Illustrator of all process wastes discharged to ground to the Process Unit of the plant originating each waste. Receipt of the analytical report direct from 222-S Laboratory will satisfy item 5 for the Exposure Illustrator, but he must also receive a written report promptly for the other four items from the responsible Process Unit. Failure to sample and report promptly may delay future disposals for lack of dependent information on the fate of previous disposals.

It is suggested that the system of numbering successive batches used for TBP scavenging also be used for first cycle scavenging. This consists of consecutive numbers for the batches followed by the number of the tank in which each was settled. For example, the tenth tankful of TBP scavenged waste was numbered 10-108-BY. The first tankful of first cycle supernate ready for disposal is therefore 1-104-TY.

A further requirement for ground disposal of scavenged supernate is that the quantity of precipitates discharged to the soil with supernate shall be minimized. This is accomplished by decanting the supernate with a floating intake connected to the pump, and by watching the signal from a continuous gamma monitor mounted on the pipeline so that the pump can be shut off when a sudden increase in the signal indicates that the sludge level has been reached. Failures to shut off the pump when precipate first starts to appear, as shown by the gamma monitor or as observed in samples, shall be reported by Process Unit with the other items above, together with an estimate of the amount of slurry or precipitate discharged to ground. Failure to minimize sludge sent to a crib may require abandonment of the crib to prevent washing the particulate matter down the soil column into the groundwater.

Data reported to the Exposure Illustrator may be obtained during normal 700 Area working hours for reference purposes. On a fiscal year schedule the Exposure Illustrator publishes a classified document summarizing all data reported to him on radioactive liquid waste discharged to ground. Copies of these documents are addressed to responsible management and may be obtained by others through Classified Files.

H. V. Clukey
RADIOLOGICAL ENGINEERING

HV Clukey:dc

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